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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,979	09/25/2003	Alexei Trifonov	004-03US1	8105

7590 11/17/2006

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EXAMINER	
SHAN, APRIL YING	
ART UNIT	**PAPER NUMBER**
2135	

DATE MAILED: 11/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/670,979	TRIFONOV, ALEXEI	
	Examiner	Art Unit	
	April Y. Shan	2135	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *25 September 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-14 have been examined.

Priority

2. Examiner is aware of the application claims priority of U.S. Provisional Application No. 60/445,805, filed on February 7, 2003.

Specification

3. The disclosure is objected to because of the following informalities:

a. On page 1 of the specification, "filed on February 7, 2002" should be " filed on February 7, 2003" under "Claim of Priority".

Appropriate correction is required.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 7-14 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 7-14 are directed to a method for protecting public key schemes. The examiner respectfully asserts that the claimed subject matter does not fall within the statutory classes listed in 35 USC 101. The claimed steps do not result in a tangible result. Claims 7-14 are rejected as being directed to an abstract idea (i.e., producing non-tangible result) [tangible requirement does require that the claim must recite more than a 101 judicial exception, in that the process must set forth a practical application of

that 101 judicial exception to produce a real-world result, Benson, 409 U.S. at 71-72; 175 USPQ at 676-77).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bethune et al. (U.S. Patent No. 6,188,768) in view of Townsend (U.S. Patent No. 5,953,421).

As per **claim 1**, Bethune et al. discloses a reflecting key encoding station ("a second channel end 20" in fig. 2 corresponds to Applicant's a reflecting key encoding station) for a two-way quantum key distribution (QKD) system, comprising:

a phase modulator ("phase modulator PM2" in fig. 2);

a Faraday mirror ("a Faraday mirror (FM) 22" in fig. 2) arranged to reflect pulses of radiation arriving from a transmitting key encoding station ("The first channel end 10" in fig. 2 corresponds to Applicant's transmitting key encoding station) through the phase modulator ("The second channel end 20 includes a Faraday mirror (FM) 22 for returning light pulses received from the first channel end back with orthogonal polarization" – e.g. col. 4, lines 55-58 and fig. 2);

a controller, coupled to the phase modulator, that provides a first gating signal to the phase modulator to activate the phase modulator to modulate one of the pulses of radiation ("...At PM2, the user at the second channel end modulates the second pulse P2..."); and

a single-photon detector ("power meter monitor 28" in fig. 2) coupled to the controller and gated with a second gating signal from the controller to detect pulses of light entering and/or leaving the reflecting key encoding station (col. 6, lines 1-5).

Bethune et al. discloses a reflecting key encoding station for a two-way quantum key distribution system, comprising a phase modulator, a Faraday mirror, the phase modulator modulate one of the pulses of radiation and a power meter monitor. But it did not explicitly disclose a controller couple to the phase modulator to provide a first gating signal to the phase modulator to activate the phase modulator and the power meter monitor and the power meter monitor is a single-photon detector.

However, such missing limitations in Bethune et al. is clearly taught in the aforementioned Townsend reference by disclosing ("The receiver 2 has its own local control microprocessors 54 in fig. 4 which controls a respective phase modulator 42 via a modulator driver 52..." – e.g. col. 4, lines 53-57) and ("single-photon detector 10 or 11 in fig. 3 at a receiver 3)

Bethune et al. and Townsend are analogous art in that they are of the same field of endeavor, that is, a system and/or method of communication using quantum cryptography. It would have been obvious to a person in the art at the time of the invention to incorporate controller as taught in the Townsend reference into the Bethune et al.'s reflecting key encoding station motivated by to "control a respective modulator", as taught in col. 4, lines 53-55. Also, it would have been obvious to replace Behune et al.'s power meter monitor with Townsend's single-photon detector motivated by single-photon detector works well with fiber-optic cryptographic and beyond breakdown, which is well known in the art.

As per **claim 2**, the combined teachings of Bethune et al. and Townsend discloses a reflecting key encoding station as applied in claim 1. Bethune et al. further discloses including a beamsplitter ("beamsplitter 60" in fig. 5B and fig. 5C) arranged to direct a portion of the pulses of radiation to the single-photon detector (col. 9, lines 15-23).

As per **claim 3**, the combined teachings of Bethune et al. and Townsend disclose a reflecting key encoding station as applied in claim 1. Bethune et al. further discloses including a photon-emitting device arranged to provide a calibration radiation beam to the single-photon detector (col. 6, lines 1-4).

As per **claim 4**, the combined teachings of Bethune et al. and Townsend disclose a reflecting key encoding station as applied in claim 1. Bethune et al. further discloses including an optical coupler ("attenuator 24 in fig. 2 may be a conventional 2x2 fiber optic coupler" – e.g. col. 5, lines 47-48) arranged to direct at least a portion of the pulses of light to the single-photon detector (col. 5, line 59 – col. 6, line 1).

As per **claim 5**, the combined teachings of Bethune et al. and Townsend disclose a reflecting key encoding station as applied in claim 1. Bethune et al. further discloses including an optical switch arranged to selectively reflect the pulses of light to the single-photon detector (col. 9, lines 15-39).

As per **claim 6**, the combined teachings of Bethune et al. and Townsend disclose a reflecting key encoding station as applied in claim 1. Bethune et al. further discloses including a photon-emitting device optically coupled to the single-photon detector and adapted to emit single-photon pulses ("...assures that the return pulses are single-photon pulses. The term "single-photon pulse"..." – e.g. col. 5, line 59 – col. 6, line 1) in order to calibrate the single-photon detector.

As per **claim 7**, Bethune et al. discloses a method of improving the security of a two-way quantum key distribution (QKD) system, comprising:

providing a reflecting key encoding station having a single-photon detector ("power meter monitor 28" in fig. 2); and

monitoring radiation pulses incoming to and/or outgoing from the key encoding station using the power meter monitor (col. 6, lines 1-5).

Bethune et al. discloses a method comprising a power meter monitor and to monitor radiation pulses incoming to and/or outgoing. But it did not explicitly disclose the power meter monitor is a single-photon detector.

However, such missing limitations in Bethune et al. is clearly taught in the aforementioned Townsend reference by disclosing ("single-photon detector 10 or 11 in fig. 3 at a receiver 3)

Bethune et al. and Townsend are analogous art in that they are of the same field of endeavor, that is, a system and/or method of communication using quantum cryptography. it would have been obvious to replace Behune et al.'s power meter

monitor with Townsend's single-photon detector motivated by a single-photon detector works well with fiber-optic cryptographic and beyond breakdown.

As per **claim 8**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 7. Bethune et al. further discloses including calibrating the single-photon detector with a photon-emitting device located within the reflective key encoding station (col. 6, lines 1-4).

As per **claim 9**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 7. Bethune et al. further discloses including gating the single-photon detector so that the single-photon detector detects light pulses corresponding to a time period during which a phase-modulator in the reflective key encoding station is activated (col. 5, lines 59- col. 6, line 1).

As per **claim 10**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 9. Townsend further disclose including sending a gating pulse from a controller to the single-photon detector to gate the detector (Townsend, col. 4, lines 53-57).

As per **claim 11**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 7. Bethune et al. further discloses randomly activating an optical switch to direct some of the incoming radiation pulses to the single-photon detector; and gating the single-photon detector to detect the randomly directed incoming radiation pulses (col. 5, lines 46-51).

As per **claim 12**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 7. Bethune et al. further discloses randomly activating an optical switch to direct some of the outgoing radiation pulse to the single photon detector; and gating the single-photon detector to detect the randomly directed outgoing radiation pulses (col. 5, lines 59-61).

As per **claim 13**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 7. Bethune et al. further discloses randomly activating an optical switch to direct some of both the incoming and outgoing radiation pulse to the single-photon detector; and gating the single-photon detector to detect the randomly directed incoming and outgoing radiation pulses (col. 5, lines 46-51 and col. 5, lines 59-61).

As per **claim 14**, the combined teachings of Bethune et al. and Townsend disclose a method as applied in claim 7. fig. 7 and col. 4, lines 5-40 in Townsend further discloses counting the average number of photons per radiation pulse in a given time interval entering and leaving the reflecting key encoding station using the single-photon detector; and comparing both values to detect the presence of radiation pulses entering the reflective key encoding station that were not sent by the transmitting/receiving key encoding station.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- U.S. Patent No. 5,850,441

- U.S. Patent No. 6,529,601

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to April Y. Shan whose telephone number is (571) 270-1014. The examiner can normally be reached on Monday - Friday, 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Y. Vu can be reached on (571) 272-3859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AYS

09 November 2006
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11/13/06